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(54) Title: SINGLE CRYSTAL SHAPE MEMORY ALLOY DEVICES AND METHODS

(57) **Abstract:** Devices and methods of making devices having one or more components made of single crystal shape memory alloy capable of large recoverable distortions, defined herein as "hyperelastic" SMA. Recoverable Strains are as large as 9 percent, and in special circumstances as large as 22 percent. Hyperelastic SMAs exhibit no creep or gradual change during repeated cycling because there are no crystal boundaries. Hyperelastic properties are inherent in the single crystal as formed: no cold work or special heat treatment is necessary. Alloy components are Cu-Al-X where X may be Ni, Fe, Co, Mn. Single crystals are pulled from melt as in the Stepanov method and quenched by rapid cooling to prevent selective precipitation of individual elemental components. Conventional methods of finishing are used: milling, turning, electro-discharge machining, abrasion. Fields of application include aerospace, military, automotive, medical devices, microelectronics, and consumer products.



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